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# Disappearing in the night: an overview on trade and legislation of night monkeys in South and Central America

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## ABSTRACT

Night monkeys (*Aotus* spp.) are traded internationally, primarily legally for the biomedical industry. We present a quantitative analysis of this trade from all nine range countries, over four decades, and compare domestic legislation to CITES regulations. Night monkeys were exported from eight of the nine habitat countries, totalling 5,379 live individuals and 7,099 specimens, with trade of live individuals declining over time. In terms of species the most commonly traded was *Aotus nancymae* (present in Brazil, Colombia, Peru) followed by *A. vociferans* (Brazil, Colombia, Ecuador, Peru) and *A. zonalis* (Colombia, Panama). There was no significant correlation between levels of trade and species' geographic range size or the number of countries in which a species occurs. Five countries have legislation that meet CITES' requirements for implementation, whereas the other four countries' legislation showed deficiencies. Research conducted in Colombia, Peru and Brazil suggests significant cross-border trade not captured in official international trade registers. Although international trade diminished, current trends suggest that populations of rarer species may be under unsustainable pressure. Further research is needed to quantify real trade numbers occurring between habitat countries.

**KEY WORDS:** *Aotus*; *CITES*; *douroucoulis*; *domestic legislation*; *malaria research*; *Neotropics*; *owl monkeys*

## INTRODUCTION

Primates worldwide are threatened through habitat loss, forest fragmentation, overhunting as well as legal and illegal trade, including the trade for consumption, medicine and as pets [Duarte-Quiroga et al., 2003; Nekaris and Jaffe, 2007; Ceballos-Mago et al., 2010; Nijman et al., 2011; Strier, 2011; Svensson and Friant, 2014; Nijman and Healy, 2016]. Primates are traded domestically, for instance within a village or from one village to the next [Nekaris et al., 2010], regionally, for instance from one province to the next [Shanee et al., 2015b; Nijman et al., 2016], across international borders from one country to the next [Maldonado et al., 2009], and globally, from one continent to another [Mack and Mittermeier, 1984; Nijman et al., 2011]. This trade occurs within and amongst primate range countries and non-primate range countries [Nijman et al., 2011]. While much of the international primate trade follows domestic legislation and international agreements, some of it is illegal [Maldonado et al., 2009; Nijman and Healy, 2016]. Partially due to their cryptic nature, nocturnal species have often been excluded from studies on trade [Nekaris and Nijman, 2013; Svensson and Friant, 2014]. Recent work has, however, found them to be increasingly threatened by both domestic and international trade [Shepherd et al., 2005; Maldonado and Peck, 2014; Nijman and Nekaris, 2014; Svensson and Friant, 2014; Shanee et al., 2015b; Svensson et al., 2015].

In assessing the scale and traceability of the trade, the ever-changing taxonomy of many primate taxa is problematic as outdated taxonomies and synonyms lead to difficulties in identifying which species are traded from where [Mace, 2004]. Again, this is especially prominent in nocturnal primates, which have seen significant taxonomical changes as, until recently, their true diversity in terms of number of species has not been recognized [Hershkovitz, 1983; Groves, 2001; Nekaris and Bearder, 2011].

A case in point are the night monkeys (*Aotus* spp.), also referred to as owl monkeys or douroucoulis. Their range is vast, encompassing the Chaco plains of Argentina in the south to Coclé del Norte in Panama's rainforests in the north [Fig.1; Fernandez-Duque et al., 2013]. Since night monkeys were first described in 1802 by Félix de Azara [Goldman, 1914], the taxonomy and suggested arrangements of the number of species and subspecies has been greatly debated [Defler and Bueno, 2007]. Until 1983, when nine taxa were suggested, they were thought to comprise only one species, *Aotus trivirgatus* [Hershkovitz, 1983]. Here we follow the taxonomy used by Fernandez-Duque et al. [2013], recognizing 11 species, which also coincides with the International Union for Conservation of Nature's (IUCN) Red List. Two of these are listed as Least Concern on the 2016 assessment (*A. azarae* and *A. trivirgatus*), three as Near Threatened (*A. nigriceps*, *A. vociferans* and *A. zonalis*), four as Vulnerable (*A. brumbacki*, *A. griseimembra*, *A. lemurinus* and *A. nancymae*), one as Endangered (*A. miconax*), and one as Data Deficient (*A. jorgehernandezii*) [C. Schwitzer, Pers. Comm].

The population trends for all species are either considered decreasing or unknown by the IUCN Red List, none is listed as having stable or increasing population trends [IUCN, 2008].

INSERT FIGURE 1 HERE

Like many other primate species, most night monkey species are threatened by varying levels of habitat loss throughout their range, mainly caused by expansion of the agricultural frontier, cattle ranching, logging, armed conflict and mining operations [Butchart et al., 1995; Strier, 2011; Shanee et al., 2015a]. Additionally to these threats, night monkeys have been, and continue to be, illegally traded domestically, regionally

and internationally [Mittermeier et al., 1994; Maldonado et al., 2009; Shanee, 2012; Ruiz-García et al., 2013; Shanee et al., 2015b].

In this study we firstly provide an overview of the trade in night monkeys from the 1960s onwards, and secondly we present the results of a quantitative analysis of the international trade in night monkeys from all nine South and Central American range countries. Finally we provide an overview of the relevant domestic legislation and how well this complies with the rules and regulations of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and how this compares to recorded levels of international trade. We hypothesize that the combined effect of legal and illegal trade is a real and emerging threat even for cryptic primate species and we intend this overview document to be available for conservation planning.

## **METHODS**

We downloaded data on the export of night monkeys from the CITES trade database (<http://trade.cites.org/>) for the period 1975 – 2014 (data from 2015 were not yet available). For four 10-year periods (Table 1) we established the number of live and dead individuals that were exported from range countries as well as the number of specimens. It is possible to overestimate the number of individuals when counting specimens in the CITES database as specimens are defined as any readily recognizable part or derivative of the animal (we use the definition of specimen as described by [www.CITES.org](http://www.CITES.org)). To avoid this we excluded specimens where it was specified that the export was in metric volume units or as shipments. We restricted dead individuals to bodies and skins to avoid possible double counting (a skin and a skull exported on two

separate occasions could be derived from the same individual), as such our numbers represent a minimum estimate.

The reliability of the records in the CITES database is entirely dependent on the accuracy at which CITES Parties report data. It has documented that there can be large discrepancies between officially reported import and export figures and the actual imports or export figures [Blundell and Mascia, 2005; Nijman and Shepherd, 2010]. Indeed, we found that some of the reported quantities differed significantly between the importing and the exporting Party, and reporting rates for certain countries were suspected to be lower than what was actually traded internationally. Unfortunately it was not possible to assess to what extent these discrepancies are intentional. As import data (reported by the importing country) and export data (reported by the night monkey range country) did not always coincide, we cross-checked the data and included the largest overall totals by comparing data from importing and exporting countries. We checked all re-exports (when an individual is exported by one country after it has been imported from another) to prevent double-counting. By its very nature, the CITES trade database only holds records of international trade, trade that is reported (either by the importing Party and/or the exporting Party), and, to a lesser degree, seizure data. It does not hold information on domestic trade or the illicit trade. Reports of exports or imports in the CITES trade database are conservative in the taxonomy employed, with the majority of the entries being labelled as *A. trivirgatus* or simply as *Aotus* spp. We corrected the species name where possible as to reflect our current understanding of night monkey taxonomy and geographical distribution and to better understand the impact of trade on each individual species. Where we were not able to identify or infer the species involved, we use *Aotus* spp. We are aware that due to (illegal) cross-border

trade, it is possible that species additional to the ones that occur naturally within a country may be re-exported; we expect that in absolute terms this will concern a small number of individuals but we have no way to verify this.

Using annual totals of individuals exported we explored whether or not there has been an increase or decline in the number of night monkeys traded over the 40 year period. We then checked whether or not species with an overall larger geographic range or species that occurred in multiple countries were exported in larger numbers [IUCN, 2008; Fig. 1]. Geographic range sizes were converted to ranks prior to analysis.

All range countries provide some level of legal protection for night monkeys (Table 2), although in varying degrees according to the CITES National Legislation Project (NLP) (Table 2) [Vasquez, 2003; CITES, 2016a]. CITES' NLP is the mechanism for assisting and encouraging the CITES Parties' legislative efforts, and places the Parties in three different categories according to how well domestic legislation matches CITES legislation. These categories are: Category 1) legislation that is believed generally to meet the requirements for implementation of CITES; Category 2) legislation that is believed generally to meet only some of the requirements for the implementation of CITES; Category 3) legislation that is believed generally not to meet the requirements for the implementation of CITES [Vasquez, 2003; CITES, 2016a]. We gathered information on country specific legislation relating to CITES and wildlife trade using searchable legislative and policy databases such as Bagheera's Endangered Species Legislation Compendium (<http://www.bagheera.com/endangered-species-laws-i>), the Food and Agriculture Organization of the United Nations' FAOLEX database (<http://faolex.fao.org/>) as well as from our own extensive knowledge of working in many night monkey range countries (Argentina, Bolivia, Brazil, Colombia, Ecuador,



Panama, and Peru). We tested whether or not countries that had legislation that agreed with CITES regulations exported more or less night monkeys compared to those countries that had deficiencies in their primary legislation (i.e. legislation embracing main laws passed by the legislative bodies of the respective governments, thus excluding secondary or subordinate legislation, passed by lower levels of government).

Data were not normally distributed and we used non-parametric statistics (Spearman Rank Correlation Coefficient and Mann-Whitney U test), implemented in R, to test for statistical significance, with significance accepted when  $P < 0.05$  in a two-tailed test [Siegel, 1956].

## RESULTS

### *Historic overview of night monkey trade*

In the 1960s night monkeys were found to be the best suited primate model for medical research into malarial vaccines and for tests of anti-malarial drugs [Young et al., 1966; Collins, 1994]. Several species have since commonly occurred in the biomedical trade, such as *A. vociferans*, *A. nigriceps* and *A. nancymae* [Mittermeier et al., 1994; Maldonado et al., 2009; Galinski and Barnwell, 2012] due to the similarity of their immune system with that of humans and their high susceptibility to several forms of malaria-causing *Plasmodium* parasites [Herrera et al., 2002]. Different species of night monkeys have different susceptibility to malarial parasites, and not all are suited as animal models [Groves, 2005]. Nowadays night monkeys are also used as animal models in biomedical research regarding the human immunodeficiency virus (HIV) as they are the only New World primate that is resistant to HIV-1 [Hofmann et al., 1999], as well as ophthalmologic research due to the easily viewed retina [Ogden, 1994]. In the

decades prior to 1975, when CITES was established, the trade in night monkeys and other primates for biomedical research was vast and uncontrolled, especially from the Amazon basin [Linder et al., 2013]. Exports of wild caught night monkeys were principally to the United States of America (USA) and Europe. Trade of night monkeys and other primates from South and Central America occurred at an alarming rate, leading to national bans being implemented on exports of primates in the mid-1960s and 1970s in Brazil, Colombia, Peru, Paraguay and Panama, with official licenses being issued for limited numbers of night monkeys allowed to be exported in any given year [Brasil, 1967; Mack and Mittermeier, 1984; Maldonado and Peck, 2014]. When trade became regulated, captive breeding programs were started in the 1970s and 1980s, particularly in the USA, Peru, Panama and Germany [Gozalo and Montoya, 1990; Rappold and Eckert, 1994; Málaga et al., 1997; Obaldía III, 2001]. Despite the availability of captive bred animals, several researchers have found evidence that the international trade of night monkeys for biomedical research is continuing illegally from at least part of their range [Maldonado et al., 2009; Rojas Bríñez, 2011; Ruiz-García et al., 2013; Maldonado and Peck, 2014].

Relying on information from the literature, the domestic trade of night monkeys appears to be low, and rarely quantified in publications when mentioned [but see Maldonado et al., 2009, Levacov et al., 2011 and Shanee, 2012 for examples from Colombia, Brazil and Peru]. Due to their small body size they are not a preferred meat source, and domestic trade for meat appears limited. Furthermore, Cormier [2006] found night monkeys to occur commonly in taboos and food avoidance throughout Amazonia, and in parts of their range night monkey meat is considered distasteful due to their pungent sub-caudal scent glands [Cornejo et al., 2008; Aquino et al., 2009;

Shanee et al., 2015a]. There are however reports of night monkeys being hunted for consumption in Venezuela [*A. griseimembra*, Lizarralde, 2002], Colombia [*Aotus* spp., Parathian and Maldonado, 2010; Maldonado, 2012], Ecuador [*A. vociferans*, Mena et al., 2000; Zapata-Rios et al., 2009] and Peru [*A. miconax*, Altherr, 2007; Shanee, 2012]. Alves et al. [2010] report on *A. azarae* being used in traditional medicine in Bolivia where it is believed to cure dribbling in babies.

All primate families within South and Central America are represented in the illegal pet trade, regardless of body size [Linder et al., 2013] and night monkeys are no exception having been observed in the pet trade throughout their range: *A. miconax*, *A. nancymae* and *A. nigriceps* in Peru [Shanee, 2012; Shanee et al., 2015b], *A. zonalis* in Panama [Altherr, 2007; Svensson, 2008], *A. vociferans* in Colombia [Parathian and Maldonado, 2010], *A. griseimembra* in Venezuela [Lizarralde, 2002], *A. azarae* in Brazil [Altherr, 2007] as well as *A. lemurinus* and *A. vociferans* in Ecuador [Tirira, 2013; Stafford et al., 2016].

### ***Quantitative analysis of international trade***

Over the 40 years prior to 2014 we found international trade reported from eight range countries, with only Venezuela not reporting trade in night monkeys. We found reports of a total of 5,379 live individuals and 7,099 specimens of night monkeys exported by range countries (Table 1). There has been a significant decrease in the number of live individuals exported over time (Spearman Rank Correlation Coefficient,  $\rho = -0.619$ ,  $n = 40$ ,  $p < 0.001$ ) whereas the trade in specimens has seen a significant increase ( $\rho = 0.509$ ,  $n = 40$ ,  $p = 0.001$ ). The majority of night monkeys were exported before 1994, after this year only Peru continued to export live individuals. The live trade out of Peru

did not show an increase or a decrease over time when considering the entire 40 year dataset ( $\rho = -0.043$ ,  $n = 40$ ,  $p = 0.799$ ) but there was a significant increase in the period prior to the year 2000 ( $\rho = 0.597$ ,  $n = 25$ ,  $p = 0.003$ ) which changed to a significant decrease in the years up to 2014 ( $\rho = -0.853$ ,  $n = 15$ ,  $p < 0.001$ ). Argentina, Brazil and Ecuador only reported the export of specimens but no live night monkeys. Exports of specimens comprised 57% of the total trade, mainly *A. zonalis* from Panama ( $n = 2,702$ ), *A. azarae* from Argentina ( $n = 1,508$ ) and *Aotus* spp. from Colombia ( $n = 1,301$ ). Trade in live individuals accounted for 43% of the total trade. The USA was the main importer with 78% of import records ( $n = 152$ ). We found no difference in the levels of export between countries that had legislation that met the requirements of CITES and ones that showed deficiencies (Mann-Whitney,  $N_1 = 5$ ,  $N_2 = 4$ ,  $U = 3$ ,  $p > 0.10$ ).

#### INSERT TABLE 1 HERE

For a subset of the exports, mostly from the 1990s onwards, we have information on the origin of the night monkeys traded. Focussing on the live trade, just over half (52%) is reported as being wild-caught (W in CITES terminology), with smaller numbers being declared as captive-bred second generation offspring (C, 32%), captive-born first generation offspring (F, 10%) and ranch-reared offspring (R, 6%).

Of the exports from night monkey range countries where it was possible to determine the species (119 out of 195) *A. nancymae* was the most commonly reported (40%), followed by *A. vociferans* (28%), *A. zonalis* (16%), *A. azarae* (13%), *A. nigriceps* (2%) and *A. miconax* (1%). We found no significant correlation between the number of individuals traded and the species' geographic range size ( $\rho = -0.086$ ,  $n =$

6,  $p = 0.919$ ) or the number of countries in which a species occurred ( $\rho = -0.463$ ,  $n = 6$ ,  $p = 0.355$ ). *Aotus nancymae* were all from Peru and almost all exported alive to the USA, mainly for scientific or commercial trade purposes.

### ***Overview of legislation***

All countries where night monkeys occur are Parties to CITES, with Peru, Ecuador and Brazil joining the Convention at the time of its inception in 1975 and Argentina and Colombia joining last in 1981 (Table 2). All night monkey species are listed under CITES Appendix II, meaning that international trade requires official permission and evidence that extraction does not negatively impact wild populations [CITES, 2016b].

All countries had at least some primary legislation in place (thus no country falling under NLP's Category 3), with some specifically addressing night monkeys and others providing general wildlife protection regulations (Table 2). Five of the range countries have legislation that generally met the requirements for implementation of CITES and thus falling under NLP's Category 1 (viz. Argentina, Brazil, Colombia, Panama and Peru), whereas the other four countries' legislation showed deficiencies for implementing CITES, falling under NLP's Category 2 (viz. Bolivia, Ecuador, Paraguay and Venezuela).

Collaboration amongst South American CITES management authorities does exist. In 1978 the Amazon Cooperation Treaty Organization (ACTO) was signed between Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela, as a legal instrument recognizing the transboundary nature of the Amazon region [CITES 2014]. In 2010 ACTO established the Amazonian Strategic Cooperation Agenda, including a Subtopic (A.3) with the objective to strengthen institutional and

technical capacity of member countries from a regional perspective to manage, monitor and control trade of endangered wildlife [Dorfler and Aragón, 2011]. ACTO is collaborating with CITES to reduce illegal and unsustainable wildlife trade more effectively, for example by developing an electronic CITES permitting system for the traceability of specimens of CITES listed species during the Rio+20 United Nations Conference on Sustainable Development in 2012 [CITES, 2014]. This method and the sharing of expertise are believed to improve the ability of member countries of ACTO to reduce illegal international wildlife trade.

**INSERT TABLE 2 HERE**

#### *National level trade mitigation initiatives*

There have been a number of initiatives to curb the domestic and international trade in night monkeys; we here focus on Bolivia and Colombia representing opposite ends of the night monkey trade. While official statistics (Table 1) suggest that the number of night monkeys exported from Bolivia has declined, this is thought to be caused mainly by a reduction of monitoring activities resulting in incomplete information (A.D. Mollo Vino, Pers. Obs.). Recognizing this, the Bolivian government has been working over the last five years on increasing the implementation of CITES regulation and improving monitoring of wildlife trafficking. Practically this has led to an increase in enforcement efforts at international borders and airports, targeting a wide range of species. Its General Directorate of Biodiversity and Protected Areas has created national guidelines and actions for wildlife conservation such as the Action Plan for the Conservation of Bolivian Threatened Mammals 2014-2018 [MMAyA, 2013] and the Action Plan for the

Conservation of Threatened Vertebrate Species in the National Protected Areas System [MMAyA, 2015].

Until 2015, permits for malarial research in Colombia allowed the capture of *A. vociferans* [Maldonado and Peck, 2014]. However, due to over-extraction it became hard to source the species, which led to the biomedical laboratory Fundación Instituto de Inmunología de Colombia (FIDIC) requesting permits to capture *A. nancymae* as well [FIDIC, 2013]. *Aotus nancymae* was recently described to be present in Colombia, with a small distribution at the southern part of the Colombian Amazon, therefore extraction of individuals could be detrimental for the population's survival [Bloor et al., 2012]. Initiatives such as the agreement between the Colombian Ministry of the Environment, the National Police, and the Institute of Genetics at the National University of Colombia have enabled the creation of tools for tracing wildlife trade and attempt to improve decision making, research, sanctioning, and post-confiscation management [MADS, 2012]. Despite this, in August 2016 the regional environmental authority Corporación para el Desarrollo Sostenible del Sur de la Amazonía (Corpoamazonia) permitted the capture of *A. nancymae* for malarial research [A. Maldonado, Pers. Obs.; Corpoamazonia, 2016]. This new permit lacks information on population status of this species, and the decision obeys the political and economic influence of FIDIC. In addition, Colombian indigenous collectors resident in Peru, were allowed to be part of the team of trappers [Corpoamazonia, 2016], promoting the illegal trade of *A. nancymae* from Peru [A. Maldonado, Pers. Obs.], thus hampering the implementation, compliance, and enforcement of CITES regulations at the border between Colombia and Peru, inhabited mainly by indigenous people. In Colombia, as indeed in other night monkey range countries, ethnic groups have been recognized as

autonomous communities, with the authority to manage their natural resources. These local regulations are not necessarily framed within international legislation thus weakening community management capacity [MADS, 2012].

## **DISCUSSION**

We have demonstrated that over the last four decades trade has affected at least eight of the 11 currently recognized species of night monkeys, and that, with respect to the legal international trade, night monkey, or their derivatives, have been exported from eight of the nine range countries. The level of legal international trade of live individuals continues to decline. Only five countries have legislation that meet CITES' requirements for implementation, whereas the remaining four countries' legislation showed deficiencies. However, it is important to consider that just because legislation exists it does not mean that sufficient law enforcement is in place or that governance is high. Whilst the ACTO collaboration amongst some of the South American CITES management authorities is a step in the right direction, it is vital to increase management of the international night monkey trade. Improvements in legislation in Bolivia, Ecuador, Paraguay and Venezuela are imperative to meet the requirements for implementation of CITES.

Investigative research conducted in countries such as Colombia, Peru and Brazil suggests significant cross-border trade that is not captured in the official international trade registers [Maldonado et al., 2009; Rojas Briñez, 2011; Ruiz-García et al., 2013; Maldonado and Peck, 2014]. This illegal trade is not easily captured under CITES and it is imperative that domestic legislation extends to address and strengthen illegal in-



country activities more efficiently, as well as implement cross-border cooperative efforts involving border officials and environmental authorities.

The numbers we report here for legal trade agree largely with those reported by Maldonado et al. [2009], with any differences being attributable to the six years of additional data we had at our disposal. With respect to the numbers of night monkeys exported out of Peru our data show significantly lower levels of international trade than reported by Maldonado and Peck [2014]. They reported 3,258 animals exported from Peru, over the period 1994 to 2011, whereas we recorded a maximum of 1,925 animals, both dead and alive, being exported over this period. The discrepancy stems from the inclusion of specimens and derivatives, which cannot be attributed to individual animals, in their total.

Further research is needed to verify if the very low levels of international trade reported to the CITES Secretariat by Brazil, Ecuador and Venezuela is representative of the current situation regarding cross-border night monkey trade from these countries. While it is possible that underreporting from range countries masks higher levels of trade, it is worth noting that similar low levels of trade from Brazil, Ecuador and Venezuela were reported from importing countries thus suggesting genuinely low levels of trade. A lack of taxonomic identification ability in the relevant authorities, institutional deficiencies with respect to recording and reporting trade, or corruption could also be the cause of the apparent low levels of international trade.

While the large-scale international trade in night monkeys for biomedical research has diminished, probably due to the proliferation of breeding centres in the USA, considerable numbers of night monkeys are still traded internationally, both legally and illegally. *Aotus nancymae* was most commonly reported as traded, and is

among the most commonly used night monkey in malarial research [Maldonado et al., 2009; Ruiz-García et al., 2013]. Concerns have been raised regarding the ethical issues and the viability of using primates as biomedical research models [Pound et al., 2004; Bailey, 2005; Knight, 2008]. Further, studies of avian malarial parasites have shown to be efficient and show promise in research on malarial vaccines [Marzal, 2012].

At a global level the legal trade in night monkeys is still significant compared to most other primate taxa. Estrada et al. [2016] provided a global overview of the international trade in primates (live and dead) for the period 2005 to 2014, tabulating levels of trade at the genus level. From these data it is clear that while two genera show comparable levels of trade to that seen in night monkeys (chimpanzees and bonobos, genus *Pan*, and patas monkeys, genus *Erythrocebus*), only eight taxa showed higher levels of trade (often significantly so as in the case of macaques, genus *Macaca*) whereas 47 genera were traded in smaller numbers.

It is possible that the most heavily traded populations (such as *A. nancymaae* and *A. vociferans*) and some of the rarer species (e.g. *A. miconax*), are under excessive pressure from the current international legal and illegal trade [Maldonado et al., 2009; Shanee, 2012; Ruiz-García et al., 2013; Maldonado and Peck, 2014; Shanee et al., 2015b]. It is noteworthy that in countries like Colombia, Peru and Brazil that have domestic legislation in place that meets the requirements for implementation of CITES and that have regulatory bodies at provincial and national levels, night monkeys are evidently still subject to illegal cross border trade. This ongoing illegal cross border trade has been ongoing for decades; with Mittermeier et al. [1994] warning that trade in the northern Colombian night monkeys (*A. griseimembra* and *A. zonalis*) could be

detrimental to population levels. The effectiveness of CITES enforcement in these countries in particular are in great need of evaluation and improvement.

It is vital that night monkeys in trade are accurately and consistently identified to species level; if the taxonomy used by, for example CITES, does not reflect our current understanding of the richness in species number of night monkeys it hampers the traceability and assessment of the scale and impact of the trade. Furthermore, wildlife authorities and border personnel do not use genetic methods to determine species and are often not trained in identifying species [Shanee et al., 2015b]. The morphological similarity between night monkey species suggests the possibility of confusion or even laundering of rarer species under the guise of commoner ones. It would be beneficial to implement protocols for rapid genetic testing throughout night monkey range countries. To reduce the problematic policing of borders a more practical approach might be to control biomedical facilities.

Regulating international trade requires the cooperation of importing, exporting and re-exporting countries. With respect to the trade in night monkeys in selected range countries significant progress has been made to regulate this trade and to curb the illegal domestic and international trade; other countries still lag behind in this respect. We feel that at present a greater involvement by importing countries in ensuring that the international trade in night monkeys abides by the rules and intentions of CITES and other multinational agreements may result in the greatest benefits for night monkey populations. In more general terms, the trade in night monkeys clearly illustrate that changes in primate taxonomy need to be reflected in conservation assessments of these new taxa. For small or cryptic species occurring in trade, including night monkeys but also taxa such as galagos, slow lorises and (nocturnal) lemurs, the extent of

(international and domestic) trade is often poorly documented [Nekaris et al., 2010; Svensson et al., 2015; Reuter and Schaefer, 2016], and true levels of trade may well be a significant impediment to their conservation.

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